

## Allelopathic Effects of *Amygdalus scoparia*, *Daphne mezereum*, and *Ebenus stellata* on Seed Germination Percentage of Important Under-Floor Species

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### Extended Abstract

**Introduction:** Allelopathy refers to the plants' mutual biochemical effects. Despite their significant role in improving and restoring Iranian rangelands, the plants' allelopathic effects on each other have often been neglected in rangeland seeding. Scholars argue that in stressful conditions of the arid areas caused by low precipitation, the effects of metabolic chemicals secreted by allelochemical-full plants on adjacent species increase and allelopathy plays a more important role in creating plant communities of natural habitats. Considering the fact that seeding and sowing are considered as acceptable methods of improving and restoring rangelands in potential areas for increasing vegetation in semi-steppe and steppe areas, and that the allelopathic effects of dominant woody species are among main causes of seeding and sowing failure in some regions, this study sought to investigate the allelopathic performance of some woody species including *Amygdalus scoparia*, *Daphne mezereum*, and *Ebenus stellata* on seed germination of their understories species. Therefore, this effect should be identified for the improvement of rangelands in order to provide suitable shrub species for improvement and restoration.

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**Materials and Methods:** this laboratory study investigated the effect of aqueous extracts of *Amygdalus scoparia*, *Daphne mezerum*, and *Ebenus stellata* on their understories seed germination, using total random sampling with three replications. To this end, some fifteen samples were randomly collected from habitats of *Amygdalus scoparia*, *Daphne mezerum*, and *Ebenus stellata* in the growing season of dominant rangeland plants. The collected leaf samples were dried for 48 hours in oven at 80°C temperature for extraction (aqueous extract). Then the extraction was performed in 1:3 (w/v) ratio on all milled samples. Experimental treatments included aqueous extracts of woody leaves with 1% concentration and distilled water (control). Moreover, distilled water was used as a solvent for performing the extraction in the laboratory (24 h soaking time) which was done in cold water to simulate normal conditions. To increase the contact of the samples' particles with the solvent, a shaker device was used. To separate the suspended solids from the solvent, cold centrifuges were used at a temperature below 5°C. Then, three petri dishes with a diameter of 120mm and a thickness of 15mm (each container 1 replicate) were used for each treatment in which twenty seeds had been put. Having added the solutions, the petri dishes were tapped and placed in a growth chamber under dark conditions at a temperature of 20-25°C and 50% humidity. The seed with two cotyledons was considered as the germinated seed. The collected data were analyzed by SPSS software. Having performed a two-way variance analysis, Duncan's test was carried out to compare the means of the significant treatments. Moreover, the Excel software was used for drawing the intended graphs.

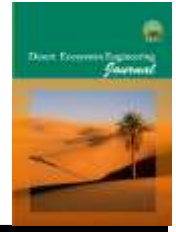
**Results:** this study investigated the effect of aqueous extracts of three woody species and the control treatment on germination rate of understories plants at 5% probability level. The results indicated that there was a significant difference ( $P < 0.05$ ) between the mean of different species' germination in most cases. It was also found that the aqueous extract of *Amygdalus scoparia* had decreasing effect on *Medicago radiata*, *Alyssum sp.*, *Ziziphora tenuior* L., the aqueous extracts of *Daphne* and *mezerum* *Ebenus stellata* reduced germination of *Astragalus podolobus* Boiss, *Alyssum sp.*, *Bromus tectorum*, and *Amygdalus lycioides*, respectively. The results also showed that the aqueous extract of *Amygdalus scoparia* had the greatest effect on the germination of the species of *Sterigmostemum longistylum* Boiss, *Clypeola aspera* L., *Lolium perenne* L. Moreover, the aqueous extract of *Daphne mezerum* increased germination of *Amygdalus lycioides* and *Ziziphora tenuior* L., while the aqueous extract of *Ebenus stellata* only increased *Astragalus podolobus* Boiss germination. Furthermore, it was revealed that the aqueous extracts of *Amygdalus scoparia*, *Daphne mezerum*, and *Ebenus stellata* had no significant effect on germination of rangeland species (*Bromus tectorum*, *Astragalus podolobus* Boiss, *Amygdalus lycioides*), seeds of *Sterigmostemum longistylum* Boiss, *Medicago radiata*, *Clypeola aspera* L., *Lolium perenne* L., *Bromus tectorum*, *Alyssum sp.*, and seeds of *Sterigmostemum longistylum* Boiss, *Lolium perenne* L., *Medicago radiata*, *Clypeola aspera* L., respectively.

**Discussion and conclusion:** according to the study's findings, the aqueous extracts of the three woody species and the control treatment had different inhibitory effects on germination and seedling growth of the understory species. However, it could generally be said that the understory species experienced the highest germination rate under the control treatment. In some cases, the aqueous extract



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was found to have decreased the germination rate, which could be due to the Artemisia active biologic properties as a toxic Sesquiterpene lactone and has a n inhibitory effect. As the woody species investigated in this study were mainly found in mountainous areas with sandy-loamy texture, it can be argued that in areas where these woody species are dominant, the leaching of understories may reduce their inhibitory effects in comparison with those of the understories' ones. Therefore, woody species do not have any allelopathic effect at low concentrations on germination of their understory rangeland seeds, and that was why they were abundantly found in the growing season of the rangeland plants under study. Some researchers argue that geographic aspects could also contribute in decreasing the species' allelopathic effects on seed germination, with the northern aspects having less inhibitory effects than the other directions. soil temperature, and the amount and intensity of light and intensity may cause meso-climatic changes. Therefore, as the germination stage is a critical stage in plants growth and early growth stages play a very effective role in plants establishment, choosing the appropriate cultivar type can guarantee the success of germination and seedling establishment under different environmental conditions. Thus, in restoration projects compatible species should be used. Generally, it could be argued that plant species may exert different effects on vegetative characteristics of habitats in arid and semi-arid climates. So, knowing the type and extent of such effects is necessary for managing, improving, and developing the rangelands.

**Keywords:** Weight-volume method, Biodiversity, Restoration of rangeland ecosystems, Aqueous extract.